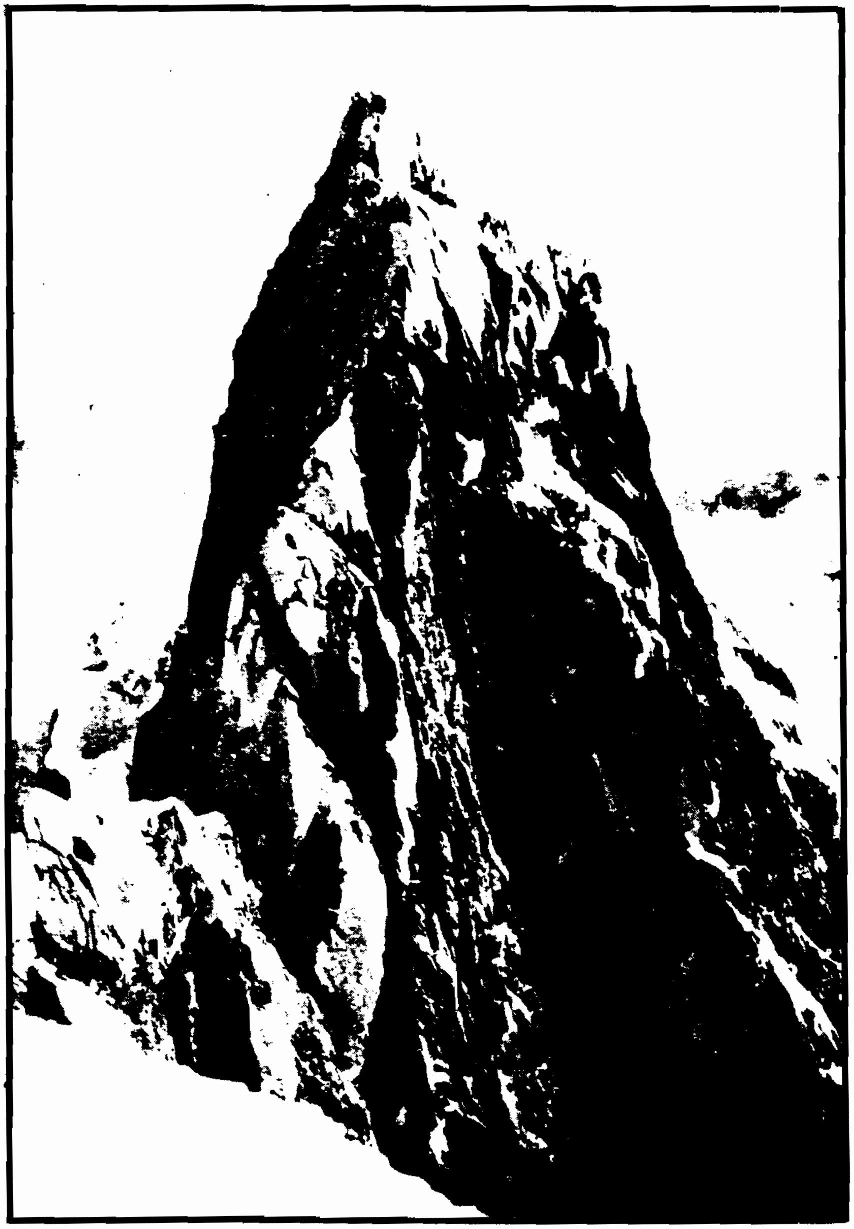
Dear Bernard,

During the last three years I have been occasionally asked to write a history of the Chemistry Department of the University of British Columbia. Now and then I have tried to do that but the result has always been too formal for my tastes. However, the following reminiscences do describe many events as I saw them . They do have some historical content but are essentially a collection of anecdotes of my professional life at three institutions.

Gil

CHEMICAL REMINISCENCES
mostly at UBC.

by J. Gilbert Hooley



Mount Waddington

13260 feet or 4042 meters above sea level
is
The Top of British Columbia
180 miles North West of Vancouver

see page 19

CHEMICAL REMINISCENCES

MOSTLY AT U.B.C.

by

J. Gilbert Hooley

born Vancouver, B.C., Sept. 26, 1914.

Contemplation of the past is one of the pleasures of retirement and I trust that some of the following recollections will also instruct the curious young about the history of U.B.C. The story is in five parts.

I. Pre-University.

I was ten in 1924. My beat was Kitsilano's West Second Avenue and I was usually welcome at one or more of three establishments. They were home at 1966 West Second, paternal grandparents at 2048 and maternal grandparents at 2298. In those three homes were four grandparents, twelve uncles and aunts, two cousins, a brother and a kid sister- a sort of tri-nuclear family. In the maternal Frisby home at 2298 hung a large colored (much red like the British Empire at the time) picture of Lord Kitchener who had directed my grandfather Tom's cavalry exploits in Egypt. They were later directed by the arrivals and departures of the C.P.R. trains, first in Revelstoke and later in Vancouver. Yes, he operated a horse-drawn carriage from the C.P.R. station at the foot of Granville Street to the suburbs of Fairview and Shaughnessy. His eldest daughter, my mother, helped to raise her eleven siblings first in London and later in Revelstoke and Vancouver. On the other side of the family my grandfather

Peter Hooley had emigrated from England in 1888. He and his son Joseph (my father) were boilermakers for the C.P.R. first in Revelstoke and later at the foot of Drake Street in Vancouver. I remember that when Peter retired in 1926 his pension was a purse of gold coins from his buddies in the shop. His daughter Elsie had taught school at Begbie, a few miles south of Revelstoke. Her class of Italian children must have loved her because once a week she would bake a cake and carefully balance it as she was transported on the hand-pumped speeder along the tracks to Begbie. First choice of the cut cake went to the kid at the bottom of the class for that week. There was however a feed back mechanism - in the following week the rest of the class had to help that favored youngster with matters academic.

We kids played in the bushland east of Cypress St., actually an Indian reserve, swam at Kitsilano beach and were thrilled by the conflagrations at the various False Creek lumber mills but disappointed that none of them ever burned down the present Cambie bridge or the old Granville bridge. Those mills, incidentally, burned their waste in huge steel cones truncated by a hemisphere of wire mesh at the top. The smoke from these and from the coal and wood furnaces in homes provided the nuclei for the condensation of water vapor to produce fogs so thick that autos would have to navigate by following the street car tracks. We were molded at the Henry Hudson School on Cornwall St. through grade 8 at which level my father's generation usually went to work. He had been a boilermaker's apprentice with the C.P.R. in Revelstoke. However, he sent me off to Kitsilano High School where some outstanding teachers in chemistry, physics and mathematics inspired several of us to go on in science.

High School graduation in 1930 was celebrated in the gymnasium by speeches from the principal and from a pleasantly loquacious classmate and a dance at which all of us were wall flowers. Some of us did have a party at Wreck beach about which my date's mother inquired. Her answer that "the boys built a fire and sat on one side while the girls sat on the other side and we all cooked wieners and drank Coke" was not far from the truth. No one could afford alcohol even if we had had a taste for it and we knew as much about contraception as the alchemists knew about elements. We did have house parties at each of our homes in turn at which the parents allowed dancing and supplied food. Music was from a steel-needled gramophone or preferably by one of us who played excellent jazz - he still does. Our girls were maturing faster than us boys as was shown at one party at which we gave them a questionnaire to fill out. It asked for a grade from 0 to 10 for each of several qualities - I remember that there was much talk about personality but there were other qualities in the list. Anyway to a man or rather to a boy we each got a zero on every one - Good work girls! This of course made it imperative to attend a university to show that in other ways we could, we hoped, do better.

II. University of B.C.

Actually I knew very little about B.C.'s only university except that it did not produce doctors or those painful dentists. They were trained only at the Universities of Toronto, McGill and the Prairie Provinces and because I had zero hope of going to any of those far-away places I registered at U.B.C. in 1930. Later I found that this institution had been set up in 1915 on the grounds of the Vancouver General Hospital. In preparation for that opening, a Mr. J.T. Gerould of the Library of the University of Minnesota had been commissioned to buy books. He arrived in Leipzig on Aug. 3, 1914 and was immediately detained for three weeks as a spy because in his belongings was a map showing the plans for a campus on Point Grey. However, he and his books arrived in Vancouver in time for the 1915 opening to 361 students in Arts and Science and 18 in Applied Science (Agriculture was started in 1917).

The president was F.F. Wesbrook, M.D. and the two Deans were George Robinson and Reginald Brock. Robinson was also professor of Mathematics and the first Registrar. He was succeeded as Dean by Dr. H.J.T. Coleman of History in 1919 and by Dr. Daniel Buchanan of Mathematics in 1928. Brock, the first Dean of Applied Science had been the Director of the Canadian Geological Survey and Deputy Minister of Mines in Ottawa. He had also directed the survey of the island of Hong Kong for the British Government. The Head of Chemistry was Douglas

McIntosh, B.Sc. Dalhousie, D.Sc. McGill. He and Ebenezer H. Archibald gave the four courses in general, organic, analytical and theoretical chemistry. Archibald was also a B.Sc. from Dalhousie (1897) and had earned his Ph.D. at Harvard in 1902. He then taught at Syracuse University in upper New York State before coming to U.B.C. in 1915. His thesis director at Harvard had been T.W. Richards who later (1914) was the first North American to receive the Nobel Prize in Chemistry. It was given for the "exact determinations of the atomic weights of a large number of chemical elements". The number was 30 and the citation goes on to say that Richards had also pioneered several new techniques such as:

1. A bottling apparatus for exact weighing in absolutely dry air.
2. A nephelometer to more precisely determine the end point of a titration of, say NaCl with $AgNO_3$. This was done by opalizing a test quantity of solution with excess reagent and comparing the amount of light reflected from it with the amount reflected from a known solution similarly opalized. I inherited one of these devices from Dr. Archibald - come and see it.
3. The use of fused silica apparatus for the manipulation of aqueous solutions. This eliminated the uptake of Na, Ca and Al ions which had previously occurred when glass was used.

Although the Prize was awarded in 1914 it was not presented until after the first world war. It is of interest that no prize in chemistry was awarded for 1916, 1917 or 1919 and, during the second world war, there was none for 1940, 1941 or 1942. The following excerpt is taken from Dr. Richard's lecture given after the presentation on Dec. 6, 1919 (Nobel Lectures QD 39 N 735). "In this day of scientific upheaval, one may well ask - What are the chemical elements? Are we to assume with recent theorists that all matter is composed of nothing but electrons and positive nuclei consisting perhaps of helium, because the radioactive elements seem partly to split into these components? Or are the old chemical elements of one's youth still worthy of recommendation?" He says yes to both noting that the collection of positive and negative particles is so stable for ordinary elements as to be permanent. And that all elements known to be essential to life have atomic weights less than 56 and amongst those only potassium is radioactive and as yet no sign of an actual loss of weight has been detected.

In 1916 R.H. Clark was added to the chemistry staff to deal with organic chemistry. He had obtained his B.A. from Toronto and a Ph.D. from Leipzig (1909). He had then taught at Clark University and at Whitman College before coming to U.B.C. In 1920 Dr. McIntosh left to accept a position in industry and later to head the department at Dalhousie. Archibald became Head, and in 1921 two more appointments were made - M.J. Marshall, B.Sc. McGill, Ph.D. M.I.T. (1921) for physical chemistry, and W. Seyer, M.Sc. Alberta, Ph.D. McGill (1921) for chemical engineering.

In 1917 the Faculty of Agriculture was started with L.S. Klinck as the Dean. Soon after this, President Wesbrook died and Dean Klinck was made President with F.M. Clement as the Dean of Agriculture. By 1924 the new Point Grey buildings were completed with the help of a narrow gauge railway between the campus and the cliff top. This was to move heavy supplies delivered by barge to the beach and hauled by cable to the terminus of the railroad at the cliff top. This was necessary because the truck road to the campus was inadequate for the transport of heavy loads.

In 1927 Professor Archibald was stricken with polio and although he continued to teach and do research, Dr. R.H. Clark was made Head. Two more chemistry professors were added before our arrival in 1930. They were J. Allen Harris in 1926 and William Ure in 1929. Harris was one of U.B.C.'s early (1922) graduates in chemistry and had gone on to doctoral work at the University of Illinois. At that time three groups in the world were trying to discover element 61 which had been predicted in 1902 to lie between $_{60}Nd$ and $_{62}Sm$. Professor B. Smith Hopkins at Illinois had obtained some monazite sand from which most of the Th and Ce had been removed for the manufacture of Welsbach gas mantles. Further fractional crystallization of the Nd-Sm residue by Hopkins and Harris finally gave a product whose X-ray spectrum as determined by L.F. Yntema at Yale coincided with the lines predicted for element 61 by Moseley's Rule. This experimentally based rule simply says that the square root of the frequency of the K line is proportional to the atomic number of the element. Soon after the Illinois announcement in 1926 of the discovery of Illinium, Professor Cork at the University of

Michigan found the X-ray lines of element 61 in a fractionated Nd-Sm product from the laboratory of Professors James and H.C. Fogg of New Hampshire. A third group under Professor Rolla at the University of Florence had obtained a similar result and described it in a sealed package deposited with the Academia dei Lincei in 1924 but it was not published until 1926. In 1933, however, Rolla, after working with 1 ton of commercial didymium, withdrew his previous claim. In that same year, Maurice Curie and S. Takvorian observed a new penetrating radiation from a Nd-Sm fraction which they and Professor Urbain believed to be element 61. They later withdrew the claim because they found it was due to Actinium and not to the elusive 61. In 1938 M.L. Pool and L.L. Quill bombarded Nd with deuterons from the cyclotron at the University of Michigan and obtained a 12.5 hr. product which they believed to be element 61. In 1947 Marinsky, Glendenin and Coryell separated several isotopes of 61 from fission products of uranium and definitely characterized them by tracer techniques. Their name of Promethium Pm has been officially adopted. Many milligrams of ^{147}Pm, a beta minus 2.6 year isotope have been isolated and visible amounts of a pink salt have been exhibited. In the 1964 edition of Friedlander, Kennedy and Miller's "Nuclear and Radiochemistry" are listed 14 nuclides of Promethium in the ground state with mass numbers from 141 to 154. They are all beta active with half lives from 30 seconds to 18 years. Hence none of them could now exist on earth unless one of them had a long lived parent still present on earth. However, there are no nuclides of nearby elements that decay to Promethium with half lives long enough to be still on earth. Of course natural uranium will contain some promethium nuclides because both ^{235}U and ^{238}U undergo spontaneous fission but their half lives for this mode of decay are 2×10^{17} years and 10^{16} years respectively. Hence the amount of promethium would be very small and has therefore not been detected. Or has it? because this is a tricky field!

The other professor added before our arrival was William Ure in 1929. He had obtained his B.A.Sc. at U.B.C. and a Ph.D. at the California Institute of Technology in 1928 where he had worked with R.G. Tolman on kinetics. Their paper on "A Test of the Radiation Hypothesis of Chemical Reactions" was a significant contribution to that field. In later years I came to know two of Bill's admiring classmates when I was a chemist at Corning Glass. They were Martin Nordberg who has his name on the Vycor patent, and Bob Dalton. Bob once told me of his own thesis project with Tolman in which he used a water powered centrifuge to rotate a metal bar about one end to detect a possible movement of electrons to the outer end. No voltage gradient could be detected - only leaks in the water system!

Well, that's the chemistry staff that greeted us in 1930 and a very fine one it was! In the three faculties there were 2040 students which was about 0.3% of the total B.C. population of 690,000. The fee was $100 in Arts and Science and that amount supplied about 30% of the total income of the University ($0.49 x 10^6 grant + $0.20 x 10^6 fees).

Today there are 45000 full-time winter session students in the three universities in B.C. This total is about 1.7% of the provincial population. The current fee at U.B.C. ranges from $865 in Arts to $1499 in Dentistry. Assuming an average of $1000 for the three universities, this supplies about 13% of the total tri-university income of $\$350 \times 10^6$ grant + $\$45 \times 10^6$ fees. This excludes $\$40 \times 10^6$ for research at U.B.C. alone. It also ignores the Junior College contributions in the first two years of post-secondary education. Anyway, there is now obviously more higher education in the Province and the student pays a smaller fraction of the total cost than in 1930. This is of course, a worldwide trend. Other comparisons are that in 1930 a hair cut cost 15 to 25¢, an ice cream cone 5¢ and a hot dog 10¢. These very popular dogs were sold at a 10 foot wide CNIB counter where the present book store coffee shop is located. There were no dormitories or bursaries and wages were 10 to 30¢ per hour and unemployment was about 30%. The provincial government was also in financial trouble and on April 15, 1932 appointed the Kidd Commission to recommend economies. The chairman, Mr. George Kidd was a director of four institutions - the Bank of Toronto, Mclellan Mcfeely, B.C. Packers and the B.C. Electric. His helpers were W.L. Macken, Austin Taylor, mining executive, A.H. Douglas and R.W. Mayhew, President, Sidney Roofing and Paper Co. These gentlemen were obviously in contact with the financial problems of the province and turned in their report on July 12, 1932. It can be seen in Special Collections HR HJ 13B7C6 and makes very interesting reading along with the Newspaper Clippings HJ13 B7 C6. The report covers many other topics than Education. For instance, they noted that of the provincial revenue of \$25 x 10^6, 15% came from the sale of liquor which in the winter of 1931 dropped 25% on an annual basis and that it might decrease still further if the U.S.A. repealed prohibition. They went on to opine that too many brands of whisky were in stock and that too many firms were bottling Bass Ale and Guiness Stout. They recommended that the staff in liquor stores be reduced by 25% and their salaries by 20%. Also that the home delivery of beer on telephone order would reduce the cost from \$2.10 to \$1.75 per dozen. The provincial debt, by the way, was \$114 x 10^6 which was 4.5x the annual revenue. It is perhaps of interest that for 1980-81 B.C. revenue was \$5700 x 10^6 of which 4.9% came from the sale of liquor. The Universities, Science and Communications received 6.3% of revenue, transportation 10.7%, education 21% and health 37%.

With respect to U.B.C. the Kidd Commission noted the current grant and then said "which in our opinion, the Government will be unable to continue next year. If this impairs the efficiency it may be in the best interests of higher education to close U.B.C. and grant scholarships to attend a university elsewhere in the Dominion". This recommendation was of course challenged by the Faculty and by the Alumni of the University. In particular, Professor Henry Angus spear-headed the opposition. He was Head of the Department of Economics, Political Science and Sociology and pointed out that the Government grant per student in B.C. was only half of that given in the Prairie Provinces. He debated with Mr. Kidd at the Vancouver Institute on September 18, 1932 and he is reported in the Province newspaper of September 26 and the Sun newspaper of September 27 to have said that modern technique was so good that industry was able to produce the world's needs with less rather than more labor. Society was concerned with a number of alternative schemes for reducing men-hours to cope with overproduction. Only the Kidd Commission proposed to increase the number of men-hours in industry by shortening the period of education. The newspaper report then continues with a direct quote from Professor Angus to the effect that "Every occupation is overcrowded from the standpoint of those in it who would like to be better paid. Here is a proposal to restrict access to certain occupations to those who can afford to pay for their own training or to those pupils of exceptional promise who may receive sholarships. To secure the comfort of these two classes the remainder are to be forced into handicrafts, salesmanship etc. Labor in these occupations will be cheap. But today these occupations are quite as overcrowded as any other". Note that these comments were made in 1932 and not in 1982!

The students solicited signatures for a petition to maintain the grant to U.B.C. The group of which I was a part tried its charms in a poor area high in North Vancouver - I personally got none. Well, the Government did not close the University but merely cut the annual grant in half. What they did about whiskey I do not know. One result of the cut was that about thirteen faculty appointments (some with tenure) were terminated. The one in Chemistry was Professor J.A. Harris and he was soon elected M.L.A. from Okanagan-Penticton - his home riding.

During his tenure in Victoria he was instrumental in initiating an annual government research grant of about $10,000 to be distributed to all three faculties at the discretion of the President. Eventually this fund ceased to be a separate grant and became an amount, voted by the Board of Governors, from the annual grant. That fund was $\$10^6$ in 1981 but was recently reduced to zero and then restored to $200,000 for the exclusive use of the humanities and social sciences.

I have a complete list of the teaching staff for 1934. It is short enough to fit - with the addresses and phone numbers - on three and one half mimeographed pages. Briefly, it consists of President L.S. Klinck, Deans D. Buchanan, R. Brock and F. Clement, Dean of Women (Miss Bollert) who insisted that ladies shall not smoke in the cafeteria, 75 Professors - Assistant, Associate and Full, 10 Instructors, 12 Lecturers and 30 Student Assistants. The total number of students was 1606. However, all of these numbers including the annual grant but excepting the President and the Dean of Women, slowly increased and the University became more accepted in the community. As noted by Professor Angus (see "The First Fifty Years" written by Frances Tucker, B.A. for the Alumni Association) "A complete change in the attitude of the public was one of the curious social consequences of the war. People are aware that survival in a third world war, and even the maintenance of our national independence in a period of peaceful prosperity, depend on the technical side of a university's activities. We must have scientists and technicians". As I record these reminiscences in 1982 I find myself hoping that some time during the second fifty years the community will realize that very little will survive a third world war and that our international preservation will depend on the socially acceptable applications of science and technology rather than on the destructive applications.

Let's go back to 1930 when I entered U.B.C. to be one of 12 heading for a B.A. in Honors Chemistry. The present degree for that course is the B.Sc. and I recall the academic humor at the general meeting in the 1950's at which the change was proposed. The problem arose of a degree for a student who did not meet the requirements for that lofty B.Sc. The proposer of the motion suggested a B.A. degree but was jeered out of court. The required courses for the honors degree in 1930 were:

English - 2 courses each of 3 lectures per week for one year.

Language - 2 courses.

Arts option - 1 course.

Mathematics and Physics - 7 courses.

Chemistry - The following 11 courses:-

Freshman - Gases, liquids and solids. Equilibrium. Periodic table chemistry of elements and compounds including industrial reactions.

No quantum theory or thermodynamics. Lab - Chemical laws and the preparation of various compounds.

Analytical - second and third years - qualitative analysis of about 30 cations using H_2S and the procedure of A.A. Noyes. The H_2S was generated from FeS and HCl in a Kipp generator and a stretcher was part of the equipment to handle the faint hearted. In addition, white NH_4Cl smoke became so thick soon after the lab started that one could hardly see the length of the hall in the old building. Quantitative analysis in the second term was very much easier on the system. Around 1950 we and most institutions changed to an H_2S generator that consisted of a test tube containing paraffin wax and sulfur which on heating produced the required gas - under a hood of course. Later in the 1950's the whole procedure was changed to one that used thioacetamide as a source of sulfide ion. This could be done at room temperature out in the lab because it did not depend on the presence of H_2S gas. Soon after that the separation of those cations was completely eliminated from all chemistry departments and a course in instrumental analysis was introduced. The stretchers were seldom used after that change and one could always see the length of the hall.

Physical Chemistry - third and fourth years - Thermodynamics, kinetics, electrochemistry, colloids and some radiochemistry. The lab illustrated these areas and required a fair amount of setting up of the experiment by the student. I remember one that required the initial preparaton of $(NH_4)PtCl_6$ and its subsequent thermal decomposition on a platinum electrode to produce Pt black. H_2 gas was then bubbled over this electrode in a solution whose H^+ ion concentration was the object of the experiment and which was calculated from the potential at that electrode by the Nernst equation.

Organic - third and fourth years - Aliphatics, aromatics and compound preparation as explained by charge transfer theory. Sugars, alkaloids etc. In the laboratory we prepared "products" which were looked at by the experts, weighed and graded and then stored so that they could not be passed on to other students in the following year or so or so. I remember one in which three of us spent three periods converting turpentine to camphor. Along the path of the reaction an intermediate compound had to be stored overnight. It was a solid with an appreciable vapor pressure and therefore evaporated into the night! We were probably given an aegrotat grade.

History of Chemistry - fourth year - one lecture per week. As I recall, all North American Chemistry Departments required such a course until the 1950's at which time it was dropped to help make way for courses in structural inorganic chemistry and in radio or nuclear chemistry. Please write 500 words on the problems associated with the determination of atomic weights during the nineteenth century (10 marks).

<u>Thesis</u> - fourth year - equivalent to 2 courses.

At the end of all these courses there was in 1934 just one job in B.C. for an honors chemist. It was at a pulp mill and required the titration of that product during one of the 8 hour shifts in each 24 hours. One of us took it - it was a job! and in the following year he went on to a distinguished career in B.C. high school science teaching. Most of us took an M.A. but before telling of our subsequent fortunes, a few words about other activities at U.B.C.

One was the annual party given to all chemists in honors and graduate work - about 40 - by Dr. and Mrs. R.H. Clark at their home on 49th Ave. It provided not only a sumptuous table and games of various sorts but also a very valuable social mixing of students from those 4 levels. Another was the Varsity Outdoor Club, V.O.C., which provided mixing at a campus level of about 300 students. The cabin on Grouse Mt. was one mile south-east of the present Chalet and could be reached from Kitsilano for 25¢ return by street car to Hastings and Columbia, ferry to North Van, street car to Kings Road on Lonsdale. Then a 2 hr climb with skis and pack to 3200 ft. The ski boots were hob-nailed climbing boots that used a toe plate on the ski to give lateral stability and a heel strap which left the heel free to move vertically. On the required Fall work hikes we cut wood for stoves and roof shakes and usually washed the dish towels. There were special trips to Crown, the Lions, Baker etc. and on New Year's Eve to the peak of Dam - 2 hr N.W. of

Grouse - to which we back-packed kindling and wood for a blazing fire to boil water for cocoa.

I also climbed a bit with Dean Brock's youngest son Philip (Pip) just after being engaged to coach him in Chemistry. On one trip, lead by his friends Don and Phyllis Munday, we went by boat and train to Alta Lake, climbed with skis to the peak of Whistler one day, Sproatt the following day and to Wedge Pass the next two days. We then spent one week in the Pass including an easy climb to the peak of Wedge on May 1, 1936. On another trip, Philip, Jim Varley and I took the work boat from Harrison Hot Springs to Fort Douglas at the north end of the lake and then walked 30 miles along the Lillooet River to the mouth of the Billygoat River. We had planned to go up the valley of this river to Wedge Pass and on to Alta Lake but we took the wrong fork somewhere and turned back three days later from, I think, somewhere near Carter Glacier. On the return trip we had no food for the day before we reached a logging camp along the Lillooet River. They fed us of course but first made us shave, or at least the cook - of Swedish origin - loaned us her husband's razor and told us to shave. It was a straight razor the like of which none of us had ever used but we were hungry and fortunately still had throats for safe passage of food after our rough shaves. Back home, parents were wondering whether or not to write us off. But my parents were remarkably stoical about my comings and goings - quiet panic I suspect. The above mentioned Carter Glacier and nearby Mt. Neal were named after Dr. Neal Carter, a U.B.C. Chemistry graduate who became Research Director of the Federal Fisheries Experimental Station in Vancouver. In 1923, he and C. Townsend had explored the area N.E. of Alta Lake and had made the first ascent of Wedge Mt. This wedged shaped peak is clearly visible from Alta Lake and, at 9485 feet or 2891 meters is the highest in Garibaldi Park. The mountain after which the Park is named is 8787 feet or 2678 meters. Incidentally, this is the only measurement for which I prefer the ancient unit because the resultant number is larger than the modern one and is therefore more representative of the work involved in climbing the mountain.

Another peak associated with U.B.C. is Mt. Pattison, again in Garibaldi Park, which is named after Dr. T. Pattison, the Registrar from 1917 to 1919. He had been a member of the first party to climb Garibaldi in 1907. I have heard that they rowed from Britannia Beach to Squamish and then continued on foot to the peak. The members of the party were Dr. J. Trorey, Dr. T. Pattison, A. Dalton, W. Dalton, G. Warren and A. King. Dr. Pattison, incidentally, taught mathematics at Kitsilano High when I was a student there in 1928.

And finally I will trace a very slender thread between the Chemistry Department and Mt. Waddington. The thread starts in June 1925 when Don and Phyllis Munday were climbing in the Forbidden Plateau area near Courtenay on Vancouver Island. From Mt. Arrowsmith they sighted to the North what turned out to be the highest mountain in British Columbia - 13260 feet or 4042 meters. Hitherto that honor had gone to

Mt. Robson at 12972 feet or 3954 meters. Of course in the Yukon, Mt. Logan at 19849 feet or 6050 meters is the highest and in Alaska, Mt. McKinley at 20322 feet or 6194 meters is even higher. In September of that same year of 1925 the Mundays made the first of eleven summer trips to the Waddington area and from the upper reaches of the Homathko Valley above Bute Inlet they saw the peak, named it Mystery Mountain and estimated it to be over 13000 feet high. The following story of their efforts to reach that peak is taken from "The Unknown Mountain" by Don Munday - call number F 5025 C 6 M 82 1946. Their return trips were usually by way of Knight Inlet and the Franklin Glacier. They climbed several peaks one of which was officially named Mt. Munday 11500 ft. But bad weather and ice on the crumbly rock prevented them from reaching the highest peak although in 1928 they did reach the N.W. peak which is only about 100 ft. lower. The journey from Vancouver to the head of Knight Inlet is 250 miles and was usually made by way of Union Steamships but in 1931 and 1932 it was made in a 15 foot row boat with an outboard engine - a form of retrenchment I suppose. However, Henry S. Hall, a Boston climber of means, had seen a photograph in the Alpine Journal of Phyllis Munday carrying a 60 pound pack as she walked on a log over a raging creek. He came West to see the phenomenon and financed the 1933 trip which started from Alexis Creek west of Williams Lake. Again, however, they did not reach the peak of Mystery Mt. In 1934 the following three parties were active in the area:

1. Sir Norman Watson and E.J. King started at Tatla Lake west of Williams Lake and by truck and horse moved supplies further west to below the snow line, carried skis to the shoulder of the big mountain and skied down to the head of Knight Inlet. Their book "Round Mystery Mountain - a ski adventure" tells the story (HR 5025 C 6 W 37).

2. Alex Dalgleish, Eric Brooks, Alan Lambert and Neal Carter (the thread to Chemistry!) set out for the peak but the first named fell 800 ft. to an instant death.

3. Don and Phyllis Munday, H. Hall, Hans Fuhrer (Canadian Rockies guide), Pip Brock and Ron Munro did reach the N.W. peak.

In 1935 the Mundays and Hall with Pip Brock and Jim Varley started up the Klinaklini Glacier from Knight Inlet but had not gone far when news came by special courier that Philip's father Reginald, Dean of Applied Science at U.B.C., had been killed in a float plane crash after take off from Alta Lake where Brock had a summer home. Pip returned to a funeral for both parents.

In 1935 the Mundays and Hall with Hinton and Chase, two young men from the Eastern U.S.A., again used the Klinaklini Glacier to reach the Waddington massif and made a number of ascents but not the high one. A second party was a combined group from the B.C. Mountaineering Club and the Sierra Club of California but again, conditions were not right. However, on July 21, 1936 two members of a third party set out at 2:45 A.M. from high camp and did reach the main peak - 13260 ft. at 3:40 P.M. and returned safely at 2:00 A.M. on July 22. The two were Fritz

Wiessner and W. House (American Alpine Journal G505 A6 1937), two American climbers with international credits to their climbing careers. Well, that's the story except that the Canadian Geological Survey officially named the peak after Alfred Waddington who in 1858 launched a company to survey a route from the Cariboo gold fields to the Homathko Valley and on to Bute Inlet. It would have been 170 miles shorter than by the Fraser Canyon to the Coast. In 1864 the Indians killed 14 of his men and the project was abandoned.

Well, back to sea level and JOBS to finance education. I think my first job was culling berries for 15¢ per hour. The following summer I rose in the social scale to 25¢ per hour at a local distillery. My job there was to transfer a double hand-full of charcoal to each of what seemed to be millions of whiskey barrels just before the giggle juice was run in and aged. The charcoal was wet because it had come from the "aged in the barrel" product - now on the way to the market! Perhaps that's why 20 years later I was attracted to chemical research with carbon - in the blood so to speak - figuratively only I might add because the mass aroma of aging spirits is not conducive to tippling. The recycling of the charcoal described above might explain some of the analytical characteristics of whiskeys as reported by J.M. Macoun in Chemistry in Canada pg. 37 for Aug. 1950. Thus for the following six whiskeys the total weights of aldehydes, fusel oils, and furfural per 100 liters of absolute alcohol are:

Canadian 6 yrs - 77.5 gm; 5 yrs - 47.5 gm; 4 yrs - 27.2 gm;

3 yrs - 31.2 gm.

Scotch - 143.6 gm.

Bourbon - 292 gm.

A third "job" was at 537 West Hastings St. where for two summers I was one of about 40 boys who constituted the last link in the Canadian National Telegraph's rapid world communication system. No one of us had a name - only a number - I think mine was 61 and we sat on a long oak bench waiting for the "chief" to bellow BOY which meant the one at the head of the line. This lucky fellow would LEAP to his feet and grovel for his assignment which was accompanied by the loud crash of the time-clock stamp on the delivery slip. Then up 20 steps to the bike-shed in the lane and off - rain or shine - on your own bike but dressed in the company's grey uniform WITH TIE and leather leggings and black shoes POLISHED every morning. If you got back to the time clock in less than 30 seconds from Pacific St. or its equivalent, the Chief would bellow GOOD BOY! and next time give you 1 or even 2 to Broadway - 10¢ each - JAM! If not you might wait at the head of the line for another SOAKER meaning 2 1/2¢ to Pacific St. I seemed to average 10 to 15¢ per hour. A few of us boys would eat our carried lunches on the grass at Victory Square. I remember supplementing that with a whole raisin pie for which I paid 10¢. Or at least I had planned to supplement it until I found that the pie had in it only one raisin in a mass of grey gelatin. Well I heaved the whole mess onto the flat roof of a building in the lane between Hastings and Pender - maybe it is still there!

One July/August I earned 25¢ per hour as a sack-bucker at the largest hop field in Sardis - 20 miles beyond Abbotsford. Two such buckers would transfer the weighed hops from the picker's baskets to a sack that held about 80 pounds. We then heaved the sack to the flat deck of a wagon. This was easy enough for the first layer but needed a mighty heave from each of us for the top layer. When the wagon was fully loaded, two horses were persuaded to haul it to the kiln in the center of the one square mile area. Here it was spread on sacking well above several wood-burning, oil drum type stoves until dry, and then compressed and packaged for sale. The flat wagon and horses had a second duty. This was to occasionally move the "convenience" station as the pickers moved along the mile-long rows of hop vines. We would first dig a new hole and then persuade the horses to position the wagon against the old structure to be moved. Then with our feet on the deck of the wagon we would apply a horizontal force to the top of the structure thereby tipping it onto the wagon. Then a slow ride to the new hole and after a careful positioning, the horizontal force was applied in the reverse direction and presto we were off to titrate the old hole with lime and earth. The following summer I bicycled to Sardis and back in one day to apply for my old job but was not hired perhaps because of poor privy positioning during the previous summer.

I also learned to handle an automobile that first summer. This was a somewhat rare accomplishment at that time and later provided me with a Winter Session job chauffeuring for Professor Archibald. He had been stricken with polio in 1927 and was left paralyzed from the waist down. He continued to lecture in analytical chemistry and I know that all of us remember our first sight of him being carried by two students to the lecture bench in room 300. His weight was supported by two joined hands during transit and then, at the lectern by hidden steel braces along his legs which could be easily locked into position so that in effect he stood upright, balanced by a cross support about 15 inches above the bench, and could even manipulate various beakers and reagent bottles placed nearby. These were used to illustrate the wet chemistry of those cations desribed by equations that had been written on the blackboard behind him. He did this from 1928 to 1942. On Tuesday and Thursday afternoons he was carried into one of the two laboratories across the hall where for three hours he answered questions amidst the smoke of NH_4Cl and H_2S. In his office there was usually a beaker of liquid evaporating on an electric hot plate in the hood. It was too remote for his personal attention so that any visitor might be asked to adjust the heater or move a beaker. The purpose was to purify some salt of Rb or Cs. This often involved the fractional crystallization of the dichloriodide - which is a beautiful orange color. Briefly, if there was any element 87 (now Francium Fr) in the casium or rubidium that he used for atomic weight measurements, its removal by fractional crystallization would lower the measured atomic weight of the caesium or rubidium. No effect was found but his work on rubidium was accepted by the International Commission on Atomic Weights.

I helped carry Dr. Archibald for three years and also drove him between his home near 14th and Arbutus and U.B.C. It was in a 1932 Pontiac Sedan which had to be hand cranked. Once a month there would be a Sunday drive somewhere on the lower mainland and occasionally an evening party either at a friend's home or as a chaperon at a student dance. One of the latter was the Engineer's Ball near Broadway and Alma after which all the tires on all the cars in the vicinity were flat. The organizers were very embarrassed and would have blown those tires up with their own lungs or at least tried to, if all cars had not carried hand-pumps in those days.

III. Graduate work at U.B.C. and M.I.T.

As noted above, several of us - about six - enrolled for an M.A. degree after obtaining the B.A. in 1934. Even after I obtained the M.A. in 1936 there were still no jobs in B.C. for such graduates. Several of us therefore applied for admission to Ph.D. programs in various institutions in North America. We received offers of free tuition and an assistantship to pay dormitory expenses from Cal. Tech., M.I.T., California, McGill, Toronto, Princeton and Harvard. Six of us accepted such offers and looking back, it is truly remarkable that four years after U.B.C. had been threatened by closure, some of the most eminent science departments in North America offered us such opportunities. It was a fabulous compliment to the Departments of Physics, Chemistry and Mathematics and I hope it helped to ease the chagrin that the staff must have experienced in 1932. I must say that they never once showed any bitterness in our presence about that incident - the only one of its kind at a public institution in Canada.

I accepted an offer of tuition ($800 as I remember) plus dormitory expenses ($500) from M.I.T. in return for my services as a laboratory assistant for six hours per week. I agreed to appear in Cambridge on September 1, 1936. In order to save money I travelled by Chinese train to Montreal as a guard and thereby received a ticket back to Vancouver on a regular day-coach valid for one year. In fact I did this for three successive years and thereby helped the C.P.R. offer Chinese business men a special fare between China and the West Indies. On the Canadian leg of that journey the Canadian Government required the payment of a $3000 head tax or a guarantee by the C.P.R. that no passenger would "escape" into Canada. This was done by employing four guards for each of two to five sleeper coaches at the head of a regular transcontinental passenger train. None of us could leave his assigned car and two had to be on "duty" (awake) at all times. The R.C.M.P. met the train at each station stop. Guards and passengers all came aboard with enough food for the four days and we guards maintained the coal stove for cooking - mostly dried vegetables and canned fish or meat. We regularly swept and cleaned the car and kept alert but there was never any need to raise an alarm. Our "charges" were, after all, travelling between relatives at one end and a business at the other end of the journey and were sufficiently affluent to pay for a whole section which amounted to four seats per person. No, this was part of the fear in Canada of those of Asian origin and dates from the late 19th century use of indentured labor to build the C.P.R. and to mine coal on Vancouver Island. This attitude led to a law which withheld the vote from anyone born in Canada of Asian parents. This law and presumably the head tax were finally repealed in 1947.

Well, on arrival at M.I.T. I met 29 other North American males also about to start on a Ph.D. program in Chemistry. There were two other Canadians - from Alberta and Toronto - and the rest were from various parts of the United States. The program consisted of course work including Physics and Mathematics, and a research problem. I chose Physical Chemistry and worked under the department head, Professor F.G. Keyes with a team of post-doctoral fellows who had recently come from Professor Giaque's Low Temperature Laboratory at the University of California in Berkeley. I measured heat capacities from 10K to 300K of CCl_4, KH_2PO_4 and Potassium Sodium Tartrate Tetrahydrate (Rochelle Salt). The phosphate had a Curie point around 60 K and did show a specific heat anomaly as predicted. The entropy change of the transition was measured and shown to be consistent with the presence of hydrogen bonding in the crystal. The tartrate also had a Curie Temperature but did not show a large enough anomaly to be detected. The 10 K was reached by pumping on liquid H_2 which in turn had been prepared in a hydrogen liquefier that used liquid nitrogen as a precooler. I learned much practical thermodynamics and how to find leaks in a hard-soldered brass and nickel vacuum system. This was before the days of aiming a jet of helium at a suspected area and using mass spectrometry to tell whether a pin hole had admitted any helium. We used plasticene to hold water around a suspected area. A pin hole would admit water instead of air and this froze in the liquid nitrogen trap so that the pressure dropped to zero or thereabouts. My thesis was 43 pages long which was average at the time but it does make a modern thesis of 500 pages look, well, longer! Come to think of it, I have recently reviewed research proposals of about 150 pages which is tiresome. Please, can I tell you about the evening of the six hour day that two of us wrote our general examinations for the degree of Ph.D.? We walked across the Mass. Avenue bridge as we had done hundreds of times during the previous three years to eat at the Cafe de Paris. There you could get a good meal for 55 cents but on the way we stopped at a bar which we had never done before, and we each had one Manhattan. Note that prohibition had been repealed in the U.S.A. and to celebrate that we had each a second Manhattan. Then we recalled that U.B.C. had not been closed in 1932 even though the Americans were threatening to repeal prohibition and so each we had a third Manhattan. Well our joy at the thought of all those happy events knew few bounds and so we went across the street to a Woolworths and purchased pink and blue ribbons for our hair and two dime banks to solicit the good citizens along Massachusetts Avenue for a contribution to our expenses at M.I.T. Believe it or not, we heard the joyful clink of a few dimes falling into our banks. I recall that one sympathetic lady - no she was not one of those girls - had only 25 cent pieces which would of course not fit our dime banks. There was some changing of coins amongst the three of us and I have never been sure that we gained in the transaction. She may well have been a Boston banker or a Harvard M.B.A. student making a little money on the street. I forget whether we had dinner or not.

Amongst my buddies at Tech were Clarence Johnson from Alberta who served his time with Professor Beattie measuring very exact PVT data on N_2 etc. to redetermine the "ice point". I think he got 273.16 K and went on to get his name in the Smyth Report for his contributions to the diffusion process for the separation of $^{238}UF_6$ from $^{235}UF_6$ in the Manhattan Project. And Barney Vonnegut who went on to the Atmospheric Research Center in Albany N.Y., to be the first to predict the use of AgI to seed clouds that were supersaturated with water vapor. Do read Ice Nine by his brother Kurt to see whether you agree that the two of them had a session perhaps over a Manhattan or two, to discuss the possibility of the existence of a catalyst that would crystallize all of the liquid water in the world. And Howard McMahon, a Victoria College - U.B.C. graduate who worked with Sam Collins in developing a new type of helium liquefier. McMahon went on to the A.D. Little Research Corporation to organize the commercial production of the Collins Liquefier and to later become President of the Corporation. I visited Dr. Collins in 1979 at the U.S. Naval Research Laboratory in Washington D.C. where at the age of 85 he was still busy with liquefiers. He figured that 13 years of his professional life had been spent looking for leaks in vacuum systems. There was some time for fun and games in Boston but the main one was music because an unknown benefactor made it possible to attend alternate concerts of the Boston Symphony for $12.50 per season. I saw and heard Rachmaninoff conduct and play one of his Concertos and also heard the Boston debut of the boy wonder Y. Menuhin.

IV. Corning Glass Works.

On graduation there was either a Research Fellowship at M.I.T. for $2000 or a research position at Corning Glass Works for $3000 per year. I chose Corning and arrived there on July 1, 1939 to work with a very stimulating group on Vycor. That project went back to 1931 when Corning offered to try to cast a 200 inch diameter telescope reflector for Mt. Palomar. To be sufficiently rigid it would have to be 20 inches thick and weigh 20 tons. Excess glass was melted in one furnace and transferred to a ceramic mould by means of three steel ladles each suspended from an I-beam track between the furnace and the mould. Each ladle would deliver 300 pounds of glass if moved quickly. The whole operation required 24 hours during which the mould was kept at 1400°C by horizontal gas flames inside a covering cupola. Calculations involving heat transfer showed that the disc would have to be cooled to 20°C in 9 months or else it would crack or at least end up strained too much for optical use. Well, in a month or so the disc began to opalize thus indicating a phase change to produce very fine crystals in a matrix of glass. This will of course occur in any silicate glass if it is cooled at a sufficiently low rate. In the case of the glass composition used for the disc, the rate was sufficiently low. Because crystallization has an adverse effect on strength and surface properties, that disc was allowed to cool the rest of the way to 20°C at its natural rate. It did crack and is now in the Corning Museum. A second disc was started with a somewhat different composition chosen to lower the rate of crystallization so that opalization would hopefully not occur during the long cooling time. That one was a success and has been the world's largest telescope reflector - on Mt. Palomar - until a 215 inch diameter disc was recently cast in the U.S.S.R. These are probably the largest glass discs that can be cast. They have however been superseded, as far as light gathering power is concerned, by arrays of smaller discs much further than 200 inches apart. This development depended on the correlation of the separate signals by a modern computer. It is of interest that a 100 inch diameter fused silica disc will soon be in orbit and will be serviced by the space shuttle. The advantage of this arrangement is that the effect of the atmosphere will be deleted from the signal. Well, the fellows in the lab at Corning were intrigued by the opal glass and found a field of compositions in the Na_2O, B_2O_3, Al_2O_3, SiO_2 system which, when held at 500°C to 600°C for a few hours would undergo a phase change invisible to the eye. That a change had occurred was easily shown by immersion in hot acid which slowly dissolved all the non-silica oxides leaving a porous silica of pore size about 50 Å. If this was then dried and heated to 1200°C it shrank 10% in each dimension to give a clear glass which was 97% SiO_2 and 3% B_2O_3. The coefficient of expansion was only 15% of that of Pyrex. To make such a glass by direct melting of the two constituents would require a far higher temperature - 1700° - than the melting temperature of the original glass - 1300°C. The commercial applications were obvious and it finally went on the market under the trade name Vycor and is still there. When I arrived, I was assigned to measuring the expansion that occurred during acid leaching. If that was too large the sample would crack and I was asked to relate that expansion to the composition of the initial glass. Well, the method being used was very slow because a 1x10x100 mm. sample was first cut and polished by a technician, heat treated for 3 hours and then placed vertically in an acid bath in contact with an expansion dial. To speed it up, I pulled a 1 mm diameter fiber 25 cm long and formed a small bead at one end to support it in a jig while in the acid. The opposite end was observed through a travelling microscope to ascertain the amount and therefore the rate of expansion. In fact I placed four such fibers in a merry-go-round jig to get four times as much data per minute from one observer. And much less glass was needed per sample so that a small platinum crucible rather than a large clay one could be used to melt each composition. I've never been able to relate a scientist's design of such equipment to any of his academic training other than an urge to get data more rapidly and more easily.

In my second project I worked with a group on fluorescent lamps. Our object was to discover a glass which when drawn in the form of a glass tube for a lamp would itself fluoresce. This would be much simpler and cheaper than the method still used today of drawing a clear glass tube and then spreading fluorescent powder on the inside. We could never, however, reach quite as many lumens per watt as the powder method gave. Of the 1000 glasses that I melted two looked interesting for other purposes and were patented. This is of course the name of the game in industry just as the number of papers published is its equivalent in academia. Corning had a patent department which required that each person in the laboratory write a detailed daily report and have it witnessed. And a monthly report and a final report at the conclusion of a project. These were read by the research director and by someone in the patent office. I was summoned three times and helped to write three patents in my name on a U.V. transmitting glass and two fluorescent glasses but as agreed by each of us when first employed, they were assigned to Corning. Part of the agreement was the transfer of a one dollar bill to the inventor of each patent. I spent mine.

None of my three was of much value to Corning but those for Vycor and Pyroceram certainly were. The latter was the most recent in the series of inventions that stemmed from the work on phase separation and was the material used for the nose cone of the first American space rocket and is the material currently used for kitchen ware. It is initially a clear, homogeneous glass which is then heat treated to produce very fine crystals in a glassy matrix. These crystals deter the propagation of cracks and therefore increase the strength of the glass. The original composition is such that the final coefficient of expansion of the glass phase is very low - in fact I think it can be negative. The patent on this Pyroceram is in the name of Don Stookey, a classmate of mine at M.I.T.

In 1942 the chance came to return to U.B.C. as an assistant professor and I came, or I should say we came because two months after I went to Corning my old sweetheart Agnes and I were married. I had met her when she was a student in the analytical laboratory when I was a graduate student. She went on to complete Chemistry Honors and although she hated mountain climbing and especially the dirty dish towels at the V.O.C. cabin she did enjoy music and indeed acquired two degrees in piano from Toronto and London. Accordingly I kept track of her and we signed up on September 16, 1939 - the year the war started.

V. U.B.C. again

1942-49. One of my fondest memories of our return to U.B.C. was exposure to the calling card ceremony. This was organized by the Faculty Women's Club for each new faculty wife and consisted of the arrival at our apartment at 4658 West 10th Avenue of three charming members of that club. They were Mrs. R.H. Clark, my department head's wife, along with Mrs. M.Y. Williams and Mrs. F. Soward each with a calling card. I was, as I should have been, at my place of work at 2:00 P.M. and Agnes was alone on deck to be welcomed. We found later that etiquette expected a short visit of 15 minutes, no tea or cakes and for the three cards, a silver tray near the front door, to be held either by the butler or by a stand of exotic wood. Well, there was no tray - not even a butler - only an awkward search for one which was met by Agnes' warm laughter and an offer of tea and cakes which they accepted. I wish we still had the cards but we have the memory. It led to Mrs. Williams' cheery question over the decades "and how is your little wife?"

My own reception was equally warm and included my name painted on a parking space behind the Science Building - the slot at the north end of the present spaces. The other slots were able to accommodate not only those in Chemistry but also those in the two other sciences in that building. They were Bacteriology on the top floor south of the central lecture theatre and Physics in the basement and on the main floor. Chemistry was on the third floor and the north end of the top floor while Chemical Engineering used the basement wing at the south end - now largely mass spectrometry. I soon knew all these characters because I collected the annual Faculty Association fee of 50 cents. This was to cover the cost of a key on retirement and the annual fertilizer distribution. I know of no awards of such a key but when I retired in 1979 I did enjoy, along with 17 others, a special luncheon in the Executive suite of the Faculty Club. The annual NPK distribution was not a prize for merit but only a delivery to your home of ordered fertilizer at a discount. This was in line with all early universities in North America - they were agriculturally oriented! There may have been other topics at the annual meeting but I have forgotten them. Remember that it was only ten years after threatened closure and all members probably felt lucky to be employed. After the war, very dangerous radicals called for health insurance and I was made chairman of a committee of three to look into this creeping socialism. We found about eight insurance schemes in B.C. and recommended the one operated by a group of physicians - the M.S.A. As I remember, it required nearly 100% membership and a contribution of 50% from the employer. At the annual meeting that year my report followed the fertilizer report and as I rose to present it, a call came from Professor Sedgwick - "Mr. Chairman, is this a member of faculty?" Well might he ask because I had just returned from an Easter weekend in Garibaldi Park where sun and snow had changed my appearance to look like the devil. This would have conformed more closely to his real opinion of scientists because he would sometimes grab one of us by the coat lapels, look up and say: "you scientists think you are God don't you!" Obviously he had no doubt about who we were! Well, after the laughter and my report there was some discussion including some from one person who had always paid his own medical bills and preferred to continue with that system. However it did not continue and it is interesting that some of my American friends think of Canada and Mr. Trudeau as socialist. Well, as you very well know, the Federal and Provincial governments now run the health insurance scheme in Canada.

But along with fertilizer and health for the academic community there was teaching and research. Bill Ure and I each had a Freshman section of about 110 in room 300 - 3 lectures per week on Periodic Table chemistry, equilibrium, chemical arithmetic, solutions, polar molecules but no quantum chemistry or thermodynamics. We prepared our own lecture demonstrations in room 302 and wrote the midterms on the blackboard. However the Christmas and Final exams were printed, in early years by the Registrar and in later years by a commercial printer. One year the Final disappeared. The printer showed us an illegible signature on the delivery slip for the package. It turned up 3 months later behind the ice box near the back door. But at the time, we assumed that it was for sale by an underground group and so we arranged to have a different one printed. As well as lecturing I was required to organize the laboratory which was mostly preparative inorganic chemistry but which also included a neat measurement of the formation constant of the diammine silver ion. This duty included the preparation of solutions and the setting out of equipment for each laboratory period. There were six pairs of students along each side of eight benches, a total of 96 students in room 320. This was handled by one professor and one assistant whose main jobs were to prevent accidents and to persuade the students to leave the laboratory at the end of the period and to leave it reasonably clean. I was hated for a system of demerits that I introduced one year and which did not work very well. We gave it up! There was one storeroom - now room 308 with the original Dutch door still in place and one storekeeper for the whole department! The annual order was written out for Dr. Clark's approval before going to Miss Eleanor Hanna in the Bursar's office. She typed all such orders for the whole campus and sent them on to the designated supplier - for Chemistry, very often Cave and Co. at 567 Hornby St. The supplies were distributed by the storekeeper and checked by a staff member before Dr. Clark signed the authorization for payment. This was then sent directly to the supplier who presented it to the Bursar for payment. There were no department secretaries or stenographers but the President's office had two secretaries and each of the 3 Deans had one.

Our research was financed by application to the President's Research Grant that Dr. J. Allen Harris had helped to initiate or by arrangement with the Head. He, along with the other Heads, travelled each May to the Royal Society meetings in Ottawa by train. While there they obtained general grants from N.R.C. which they distributed on their return. The amounts were small in "constant" dollars but there was not that much to buy in 1942 - glassware, chemicals, heaters etc. However, that soon changed. I remember the arrival of the first Beckmann pH meter in 1943. It was paid for by a War Research grant to Bill Ure from the War Metals Research Board in Metallurgy for studies on flotation. Wow! no more H_2 gas bubbling over platinum black but I did miss the sound of the bubbles - the new method was so cold and impersonal! There were no trained personnel to help with mechanical, electrical or glass blowing problems. There was, however a lathe and a drill press in room 409 and Dr. Marshall felt that he more or less owned those devices because his office was 413. However, Dr. Seyer felt that a lathe should be in the Chemical Engineering area in the south end of the basement. One summer when Dr. Marshall was away for a month or two the lathe migrated to Chemical Engineering but the "owner" on his return did not notice the turn of events so to speak, until several weeks had passed. He was very annoyed even though the drill press was still in 409. I was not privy to the discussions that must have ensued and I have even forgotten whether the damned lathe was returned to the 4th floor or not. To finish this story I do recall that it was transferred to a new shop that was set up in 1949 in room 100 for the use of all members of the department including chemists! The last that I saw of it in those days was emitting smoke while two chemical engineers wearing asbestos mitts were heating a two inch diameter copper tube in the lathe. They were pulling on it in the hope of drawing, as one does with glass, a tapered Pitot tube. I came along in time to save the poor old lathe - I think it is still in the shop and really it should have a plaque of brass telling of its history in the building.

At this point in my reminiscences I choose to pay tribute to Bill Seyer even though he nearly asphyxiated my Agnes with cigar smoke during a winter trip in our car to Seattle. Anyway, from 1921 to 1946, Bill was the only staff member in the Chemical Engineering Division of the Chemistry Department. He gave all the lectures and labs in that field for the third and fourth years and for the M.A.Sc. degree. For organic and physical chemistry, the 10 or so engineers in each year were in the same class as the 10 or so chemists. We all got along famously and acquired as a result, a mutual respect and understanding of one another's fields which remained with us throughout our careers. A close friend of mine - Reid Fordyce - was in Chemical Engineering and went on to a Ph.D. from McGill with a thesis from Dr. Hibberts Pulp and Paper Research Institute. Reid then went with Monsanto, did early work on co-polymerization and later became Head of their New Products Division. He was later in charge of their university liaison grant division and is now retired near Tacoma. Several B.A.Sc. graduates spent five years on the island of Bahrein in the oil industry and then returned to various positions in Canada. Another, Wm. Govier, is referred to as the energy czar of Alberta. And so on. Finally, in 1946, Les Shemilt was appointed to spend half his time with Bill in Chemical Engineering and the other half in Analytical Chemistry.

Analytical balances were of course very expensive items and in the undergraduate labs it was common to have to assign five or more students to one balance. Well, that gave rise to a very weighty argument used by Dr. Andrew Hutchinson, Head of Biology to obtain money for microscopes that Dr. Clark thought should be spent on balances. Hutchy, if I may call him that, pointed out that during a given lab period one could have six chemists assigned to one balance, or even more around one explosion, but that each biologist needed one whole microscope for the full duration of the period. I believe it worked!

In 1943 when Dr. Clark returned from his annual visit to Ottawa he assigned to me a few bones from his doggie bag of goodies and told me to construct a fluorine generator and then to fluorinate acetone and some other organic compounds. I did this with the help of four thesis students. The products, said to be "nerve" gases, were sent to Suffield for testing but we never received any information about their properties. This was part of the Chemical Warfare Research effort in Canada and I still have the theses describing the work. One of the lads went on to a Ph.D. from Princeton and later became Research Director for Northern Electric in Montreal. Yes World War two was center stage and so all the windows on the campus were covered with fitted sheets of quarter inch plywood. Black out drapes were required in homes and the two gun towers at Washout Beach were built and declared out of bounds. I, being a chemist and young, was appointed G.I.O. (Gas Identification Officer) for the A.R.P. (Air Raid Precautions) unit in the University Area. I received complete gas protection clothing and took part in one practice alert near the present Australian Area west of 8th Avenue and Drummond Drive. That area housed only an army unit in barracks at the time and the officer in charge supplied the tear gas canister that gave us practice in running - me in my suit! I also gave a course in the chemistry of war gass, explosives and metals to 25 "officers in training". They marched in uniform from their barracks at Acadia Camp to the campus each morning. On arrival in the chemistry class - room 425 - they stood until I was behind the lecture bench and then at a command from their leader sat and listened and took notes until the "bell". Then off in formation to the next lecture. I came to know some of these lads - one is now a physician, another a famous architect in Canada. I never had it so good in my regular classes - in one of which two girls knitted and took notes in the front row. They were quiet and it was their fee money so why complain? They also happened to have had an excellent background in mathematics and science and later completed Bachelor's degrees in honors chemistry and became highly valued members of the radiochemistry group at the Canadian Atomic Energy Laboratory at Chalk River.

In 1944 President Klinck retired and Dr. N.A.M. MacKenzie became President. During the next 18 years he presided over an expansion from three faculties to 10 faculties. The enrolment increased from 2900 in

1944 to 5600 in the following year and then to 9400 in 1947. Of those 9400, fifty percent were war veterans. The sharp increase in enrolment was met partly by one year appointments at the Instructor level. In Chemistry for instance, about five were added, including Agnes Hooley appointed by Dr. Clark in 1944. They and the rest of us lectured to groups of up to 250 in what is now Geography 100 and to smaller groups in former Army huts. In the latter structures the blackboard was along an end wall of the hut and was not easily seen from the more remote of the 150 chairs on the horizontal floor. Three very economical suggestions were made to improve the visibility. One was to raise the elevation of the far end of the hut to about fifteen feet above the blackboard end and to saw about two inches off the back legs of all the chairs. A second suggestion was simply to tip the top edge of the blackboard toward the chairs on the horizontal floor. A third suggestion was to seat the taller students toward the back of the hut. The relative merits of these three possibilities and their associated problems were never resolved partly because there was never a period during which the necessary modifications could be made. For instance, in one twelve month period we gave Chemistry 100 four times - starting in September, January, May and July. Former Army huts were also fitted for laboratory work - some of it in the evening.

In 1945 I hustled a research grant from Corning Glass Works to do some research of my own choosing. With this money and the help of a few fourth year thesis students the kinetics of the reaction of the hydroxides of Li, Na, K, Rb and Cs with silica glass and with crystalline quartz were measured and interpreted - and published. The most interesting result to me was that the rate with quartz depended on which face of the crystal was exposed to the solution.

On Dec. 21, 1946 Bill Ure died suddenly of a heart attack while at work in his laboratory. Born in Glasgow in 1898, he came at an early age to Vancouver and after graduation from King Edward High School served overseas from 1917 to 1919. He then earned a B.A.Sc. in Chemical Engineering from U.B.C. in 1923 and a Ph.D. from the California Institute of Technology in 1928. His research with Professor R.G. Tolman was on a test of the radiation hypothesis of chemical reactions and produced one of the several crucial papers to oppose that hypothesis of reaction rates. Back at U.B.C. as a professor, he continued his work on kinetics and taught analytical chemistry, colloid chemistry and statistical mechanics. He also gave the fourth year course in the History of Chemistry. He was a very warm human being and was so very cooperative - I sure missed him.

During the summers of 1947 and 1948 I and a few others from across Canada were appointed Visiting Scientists to the Canadian Atomic Energy Laboratory at Chalk River. Travel and living expenses were provided by the Federal Government so that we could learn something about that exciting new field by attending lectures, reading and doing experimental work more or less of our own choosing. As a result, I gave for 12 years the course in radiochemistry at U.B.C. I also did some research at U.B.C. with radioactive cerium and iron oxides on the mechanism of the polishing of glass. Also with readioactive iron on the exchange of iron between solid $C_{12}FeCl_3$ and a solution of iron. A third problem dealt with the use of radioactive cobalt to study $Co_2(CO)_8$. I also lectured on a voluntary basis to many groups on the lower mainland about nuclear weapons and whether they would or would not be successful in defending the borders of sovereign states. I was always very well received but history shows that I cut very little ice in proposing the negative side of that argument. Even the booklet "One World or None" written in 1946 by seventeen world famous scientists had a similar fate. One of the seventeen was Professor Hans Bethe and it is interesting to read his recent one page article on this same subject in the New York Review of Books of June 10, 1982. He again warns us of the very grave dangers of a nuclear war.

But on May 1, 1949 I was the victim of fallout from another kind of fission - the resignation, retirement or death of all except three of the Professors in the Chemistry Department. The three were Les Shemilt, Al Harris and me. Les was the heir to the Chemical Engineering Division, Al was ill and so I was in fact heir to the whole department. It had really started in July 1948 when Dr. Clark retired and Dr. Marshall was appointed Head. This was followed in the Fall of the year by Dr. Marshall's illness and by his death from cancer in February 1949. Then, as of May 1, 1949 Professors Seyer, Reid and Holmes all resigned. Professor Seyer left to accept an attractive offer from

U.C.L.A. where he remained active well after his official retirement from that institution. Professor Christopher Reid had been added to our staff in 1947 to teach physical inorganic chemistry but in 1949 he left to accept a research position with N.R.C. in Ottawa. He did return to the department a few years later at my invitation. Professor Henry Holmes had been added in 1947 to teach organic chemistry but he left in 1949 to accept a research position at the Canadian Government Experimental Station in Suffield Alberta. The other members of the department were Instructors on one year appointments. Fortunately, several of them stayed on to

ked me to find a staff to start the lecture-lab system again in ptember. This was done mainly by advertising, a great deal of letter iting and by some interviews at the A.C.S. Summer meeting in San ancisco. A full time secretary was appointed to help me with the per work. Well, September arrived and so also did nine new Doctor- ofessors to increase Chemical Engineering from 1.5 to 3 and Chemistry om 6.5 to 9 (2 of them are still with us). I was made Chairman for e period September to July and therefore had the pleasant task of troducing the new staff at the Fall Faculty Party in Brock Hall.

During the next six years the following changes were made:

1. We acquired with help from N.R.C. and U.B.C. some modern equipment. The main items were:

   Radiochemical - we already had some counters, scalers etc. that I had brought from Chalk River in 1947 but these were several years old even at that time. We therefore acquired the most recent models and we improved the counting room and the special room in which reactions with radioactive materials were conducted.

   High Pressure Equipment for organic research with carbon monoxide etc. These devices were set up in special laboratories on the roof of the building.

   A Beckman DU Spectrophotometer and more of those wonderful pH meters.

   A Sargent Polarograph for electrochemical studies of interest to Professors Harry Daggett and Les Shemilt.

   NMR Equipment of commercial origin. The effect had been discovered in 1948 and it is of interest that the first Ph.D. candidate in Physics - Tom Collins - made his own N.M.R. apparatus to further study the application of the effect.

   A Mass Spectrometer - the first of many in the department.

2. We added more teaching staff to give, in 1955, a total of twelve professors in the three ranks, two lecturers and one research fellow.

3. We acquired a glassblower and two mechanical shop technicians and equipment for their use. A space for these shops became available when Physics moved to their new building (Hennings) and when Home Economics vacated the present north end of the shop for their new building. The Home Economics laboratories had been put there in the first place because their original Army huts behind the Chemistry building burned down one night. Curiously, the two huts used by Chemistry did not burn but I am sure that this was a coincidence. In any case they got a new building and we got shop space. That whole space incidentally, had been added to the Science building in 1939 to house a laboratory for the training of radio technicians for the R.C.A.F.
4. We acquired an assistant for the storekeeper and more area for their use. These two men were involved in organizing a system for the newly appointed U.B.C. Purchasing Agent - Mr. Al LeMarquand.
5. Plans for a new building were drawn up by a hard working committee chaired by Professor Harry Daggett. That building finally appeared around 1958 at the south end of the original Science Building.
6. We started Ph.D. work in Chemistry about 1951. Our first four candidates were all successful and are now:

   Dr. Paul DeMaine B.Sc. Witwatersrand, now Professor of Chemistry at Pennsylvania State University where he specializes in the application of computers to chemical problems.

Dr. Paul Kebarle, Dipl. Ing. Chem., Swiss Federal Inst. Technol., now Professor of Chemistry at the University of Alberta.

Dr. Wilma Elias B.A. Saskatchewan, now Professor of Chemistry at the University of Victoria,

Dr. E.M. Voigt B.Sc. McMaster, now Professor of Chemistry at Simon Fraser University.

7. Chemical Engineering was moved to the Faculty of Applied Science where it was made a separate department with its own Head.

8. Biochemistry was started within the Chemistry Department. The first Professor was Sidney H. Zbarsky B.A. Saskatchewan, Ph.D. Toronto. Two years later he and all the equipment being used in that field were transferred to the new Faculty of Medicine.

9. We became a part along with Physics and Zoology of a new Institute of Oceanography.

10. We watched the number of Faculties grow from 3 to 10. Some of these additions involved special meetings to make sure that their students would be exposed to various necessary topics in their required courses in chemistry. There was one new group however, that was initially thought by Senate to be very fragile and which would therefore require a special Freshman Chemistry course in which only they would be present. Not an easier course but, well you know, one more directed to their "needs". The Board agreed to the extra cost of such a course for the small number of students

involved but after about two years, it was abandoned. I forget the name of the group but they were really not fragile.

11. By 1955 the department was publishing in refereed Journals 1.5 papers per year per professor.

Throughout all this expansion and turmoil I was Chairman - first appointed in Sept. 1949 and renewed each July for one more year. Administrative work was not much to my liking and so finally, Charles A. McDowell B.Sc. Belfast D.Sc. Belfast was appointed Head on July 1, 1955. I still have his letter of September 1955 in which he praises the report of the Accommodation Committee chaired by Harry Daggett as a "really wonderful piece of work". He also said "I was also interested to see the range of research in the department. I think it compares very favorably with that which we have here at the moment". "Here" is the University of Liverpool. I was pleased to know that the post-war recovery of the two institutions had been so very successful. Dr. McDowell arrived in the Fall of 1955 and in the following years saw to it that the department shared fully in the post-Sputnik expansion of the major Chemistry Departments in North America. A multitude of research projects was encouraged but all this is a story better told by those more involved in that expansion than I was. Charles always encouraged my own research in the field of Graphite Compounds and was, I know, very pleased when in 1979 I received the Charles E. Pettinos Award for that work. This award is given every two years on the basis of nominations from the American Carbon Society members in about ten countries. It has now been received by seven men in three of those countries for a great variety of projects.

In 1979 I retired but only from teaching. On Dr. McDowell's recommendation the University allows me the use of a laboratory where I continue to operate some unique equipment that I have developed over the last 25 years for the study of the mechanism of intercalation in both graphites and dichalcogenides.

Unfortunately in the Fall of 1979 Dr. McDowell was stricken by polyreticulitis while on a trip to Europe. It was not until 1980 that it was even possible to bring him back to Vancouver. His recovery has been slow but real as is shown by his continued active interest in chemistry. In 1979 Professor James Trotter B.Sc. Glasgow, Ph.D. Glasgow (1957) was appointed Acting Head. Then in 1982 Professor Larry Weiler B.Sc. Toronto, Ph.D. Harvard was made Head following the appointment of Dr. McDowell to a University Professorship.

Well, that's it until 2032 when one of the children that I currently see in the Freshman Chemistry Laboratory might decide to write up his or her reminiscences. They might well recall that "in 1982 the Head was Professor L. Weiler Ph.D. Harvard 1968 and that you can still see him on the seventeenth floor of the Chemistry Tower. He will be fiddling with a reverse mass spectrometer that he calls CHONC. It will synthesize any organic compound of C, H, O and N by using the correct combination of floppy discs and push buttons. Incidentally, the land around that Tower was, in 1982, the University Golf Course.

However, in 2020 it was assigned to the new buildings for U.B.C. after the Grand Slide. This occurred in February 2017 after a heavy snow fall followed by eleven days of rain. It caused all buildings west of Wesbrook (named after the first President) to slide into the ocean. The first in was the Anthropology Museum which was surrounded by Totem Poles and other Artifacts as it slowly oozed over the mud. Do see the Video Tape U 319 for some fantastic views of this event with the sea gulls balanced on the bouncing poles as they all headed out toward the Bell Buoy. The deep, ominous ring of the Bell can be heard on the sound track."

Yours respectfully,

Gil Hooley

Gil Hooley.

November, 1982

And with appreciation to Tilly Schreinders for processing the words on one of those fascinating new devices and to Agnes Hooley for comments on style and form and especially for persuading me not to write the above as five long sentences articulated with charge transfer words such as but, however and whereas which are the ammunition of those who have a captive audience and will give it no opportunity to contribute, even at any slight pause, unless of course one reaches the end of a line and